RESEARCH AND TECHNOLOGY DEVELOPEMENT ON BIOLOGICAL WASTEWATER TREATMENT

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BIOTECHNOLOGY APPLICATIONS FOR POLLUTION CONTROL AND ENVIRONMENTAL REMEDIATION

Advantages

*Nature´s tool (microorganisms commonly present in various ecosystems)

*Non toxic residues or by-products

*Process operation under environmental conditions

*Limited energy requirements

*Limited or no reagents requirements

Disadvantages

*Limited applications (biodegradable pollutants and certain inorganic ions)

*Slower reaction kinetics

*Still highly empirical design and operation

MAIN FIELDS OF APPLICATIONS

Wastewater treatment

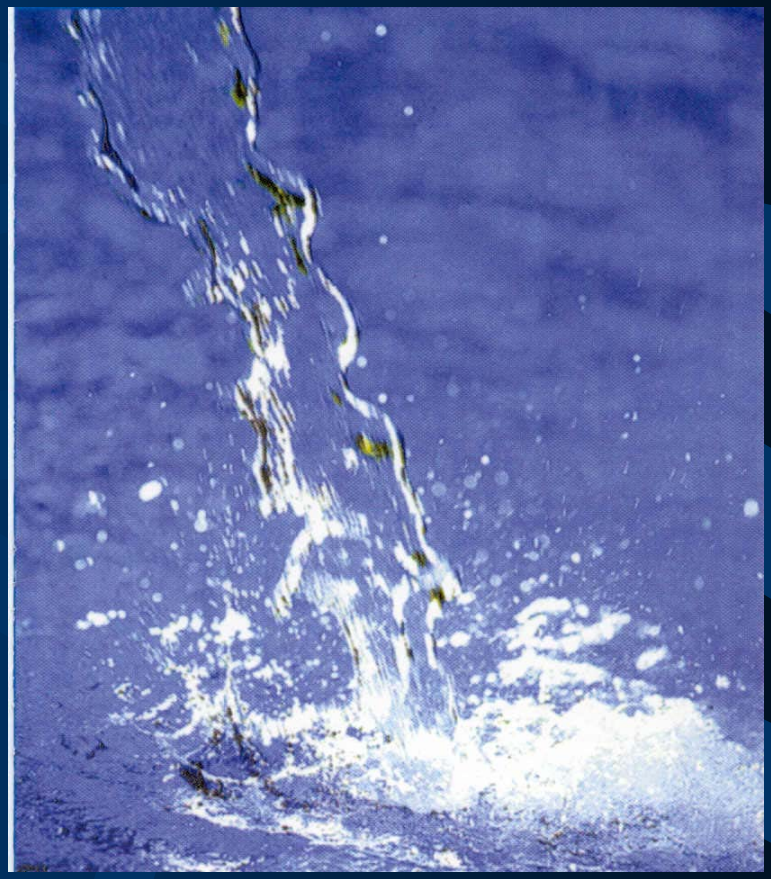
Sludge and solid waste treatment

Atmospheric emissions and odour control

Bio-remediation (soil and aquifers)

RESEARCH LINES UNDER STUDY

- Anaerobic treatment of municipal and industrial wastewaters
- Biological Nitrogen removal
- Anaerobic digestion of waste sludge and biosolids production
- Biofliters for odour control

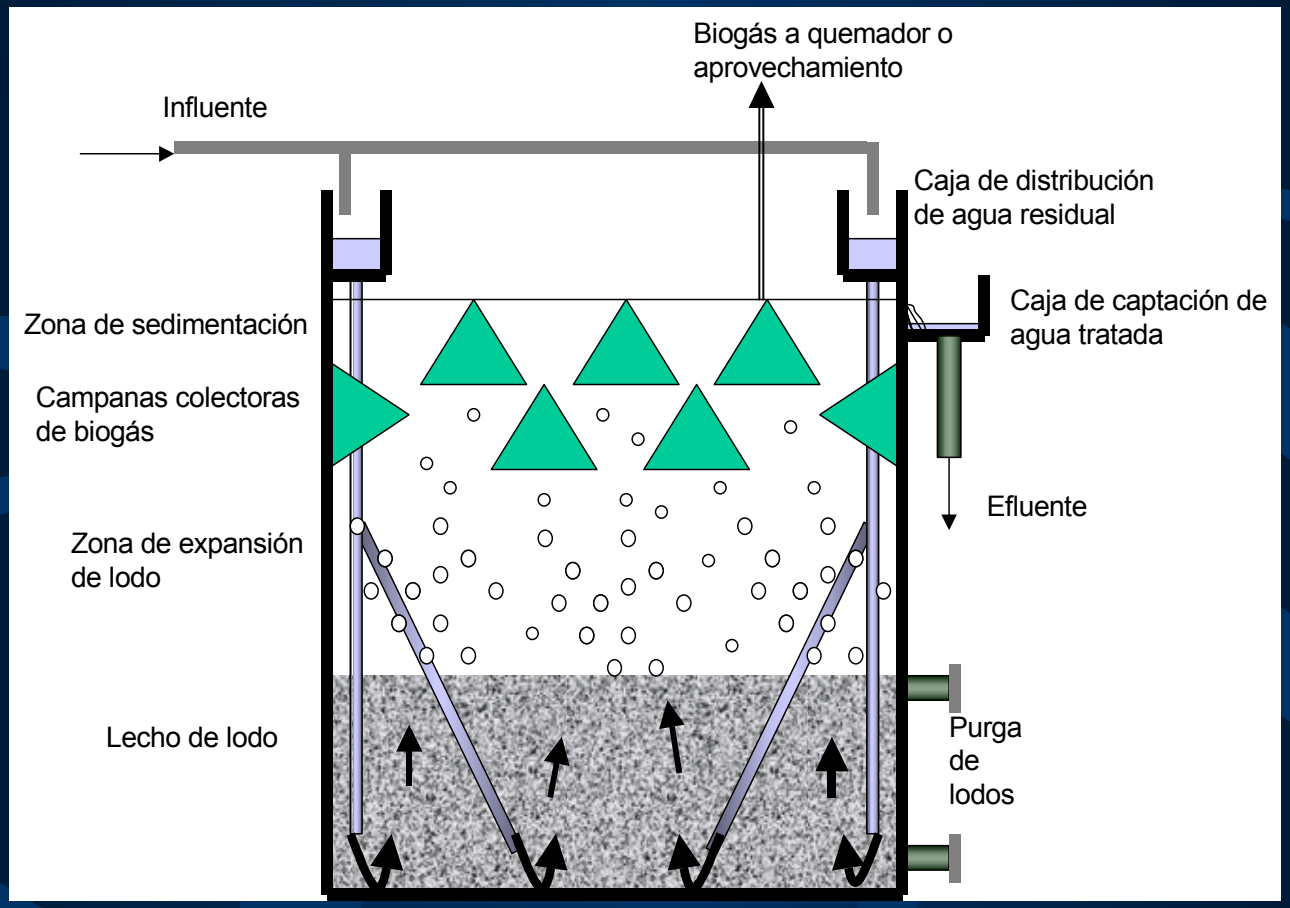


DEVELOPED TECHNOLOGY

UNAM Patents

- Up-flow reactor for anaerobic and anoxic wastewater treatment
- Inocula production for UASB reactors
- Biological removal of organic carbon and nitrogen by an anaerobic - anoxic - aerobic system with separated biomasses
- Microplant for wastewater treatment and small flows (households)

UP-FLOW REACTOR FOR ANAEROBIC AND ANOXIC WASTEWATER TREATMENT (UASB)



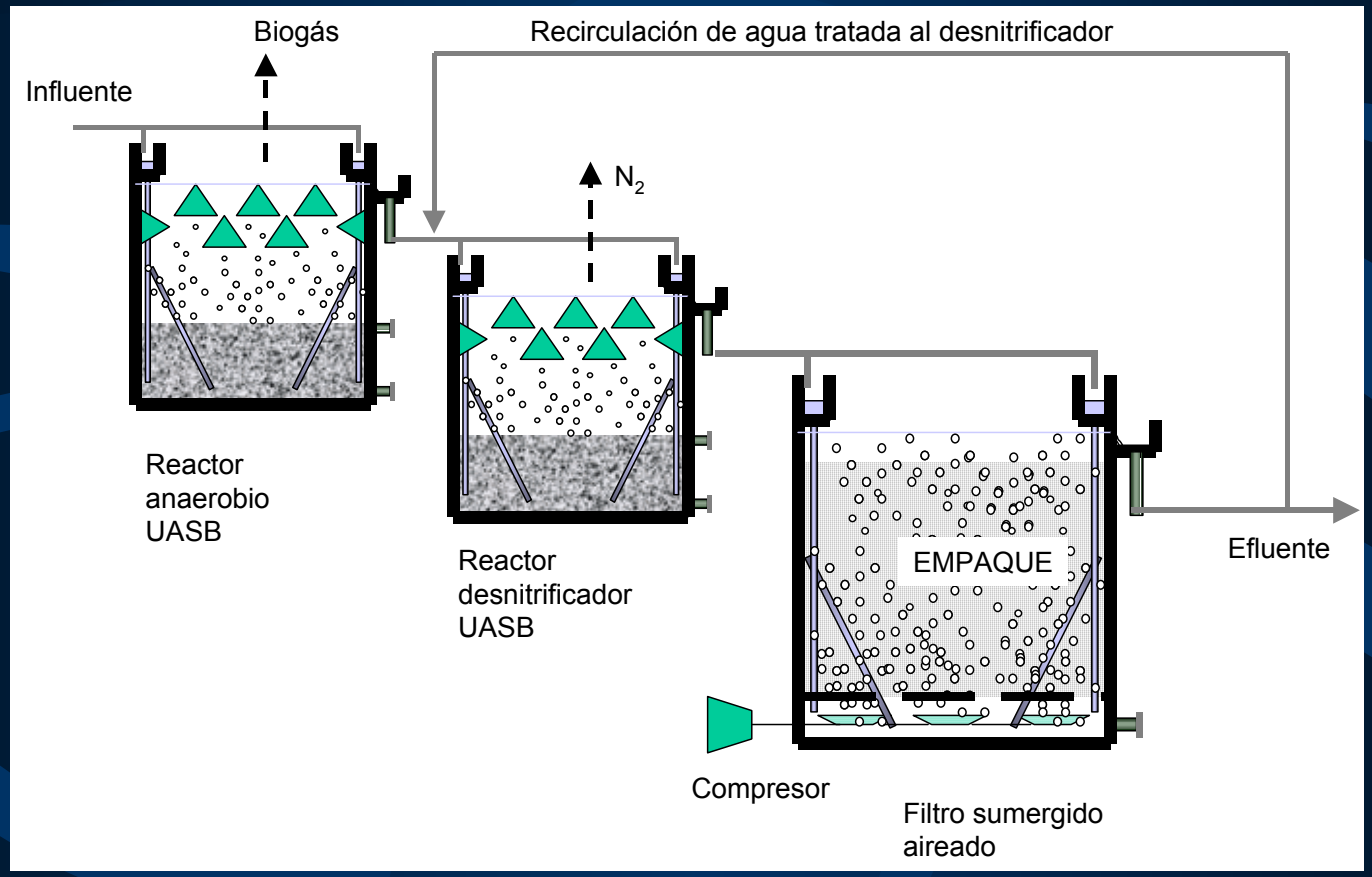
TECHNOLOGY TRANSFER

Full Scale Wastewater Treatment Plants:

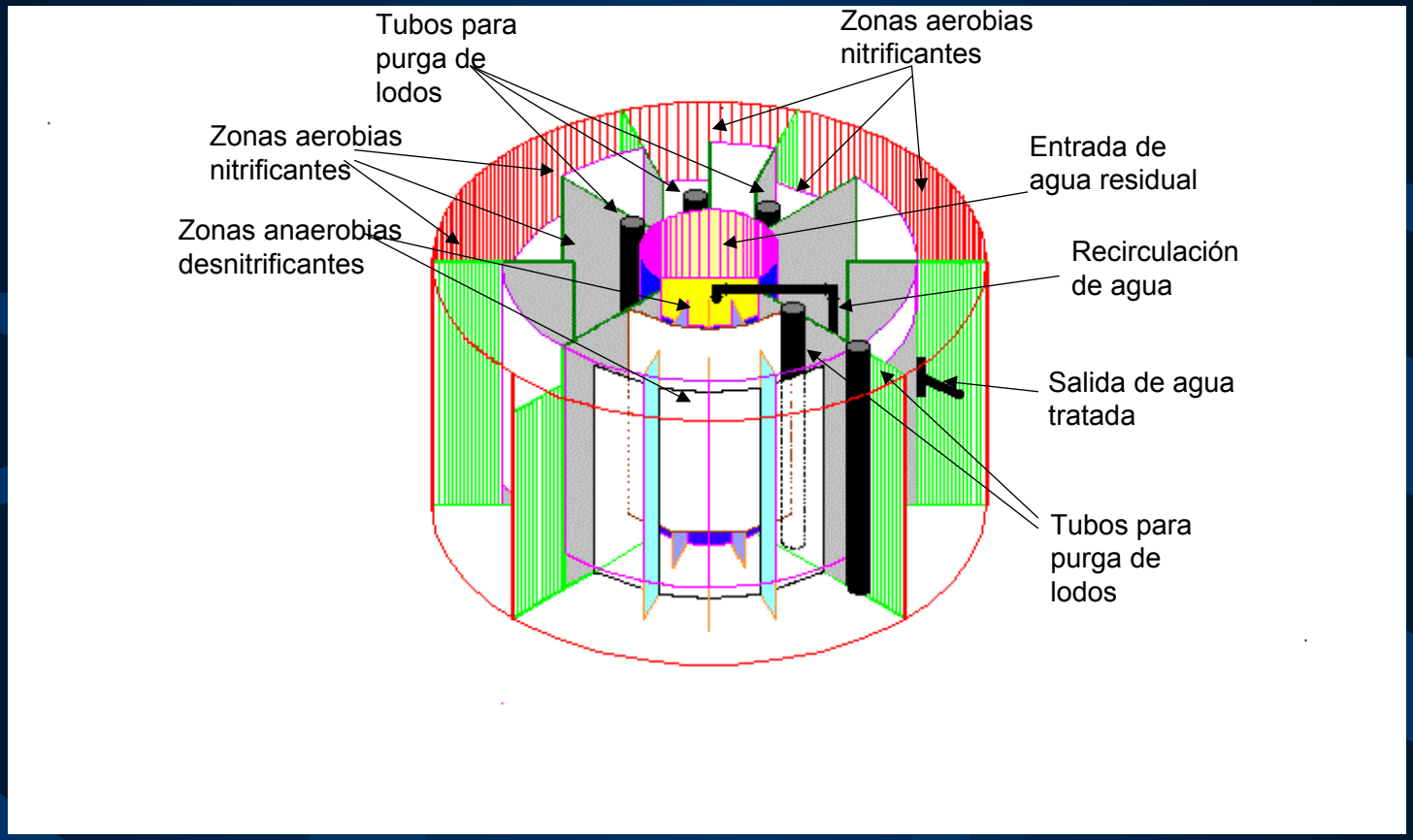
- Municipal: 7
- Domestic: 3
- Malting and breweries: 5
- Food: 4
- Chemical: 1

Technology applied in México, Chile and Argentina

BIOLOGICAL REMOVAL OF ORGANIC CARBON AND NITROGEN BY AN ANAEROBIC - ANOXIC - AEROBIC SYSTEM WITH SEPARATED BIOMASSES



MICROPLANT FOR WASTEWATER TREATMENT AND SMALL FLOWS (HOUSEHOLDS)



Patents in México, USA and Canada

DIRECTING LINES

- Research focused to adaptation and development of biological waste treatment in the mexican context
- Process integration as a strategy to develop related technologies (package solutions)
- Technology transfer as a main objetive
- Human resources formation, publication of results and participation in national and international activities

DESCENTRALIZED TREATMENT FOR SUSTAINABLE WASTEWATER MANAGEMENT

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WHAT IS NEEDED?

- Non- conventional sewer systems

- Long lasting materials and easy installation
- Small collecting sewer areas
- Lower slops, lower depth

- Adapted wastewater treatment processes

- Compact
- Efficient and reliable
- Low O & M costs
- Low production of treatment residues
- Limited environmental impact

PROCESS ARRANGEMENTS FOR WASTEWATER TREATMENT

1.- Basic process: Screen, Grit removal, Anaerobic treatment, Disinfection

2.- Basic process + Slow sand filtration, Disinfection

3.- Basic Process + Biological Nitrogen removal, Sand filtration, Disinfection

4.- Basic Process + Biological Nitrogen removal, Chemical Phosphorous removal, Sand filtration, Disinfection

5.- Basic Process + Biological Nitrogen removal, Chemical Phosphorous removal, Sand filtration, Ozonation, Adsorption on activated carbon

6.- Process 5 + Reverse Osmosis, Disinfection

In all cases, sand filtration may be replaced by a Wetland system

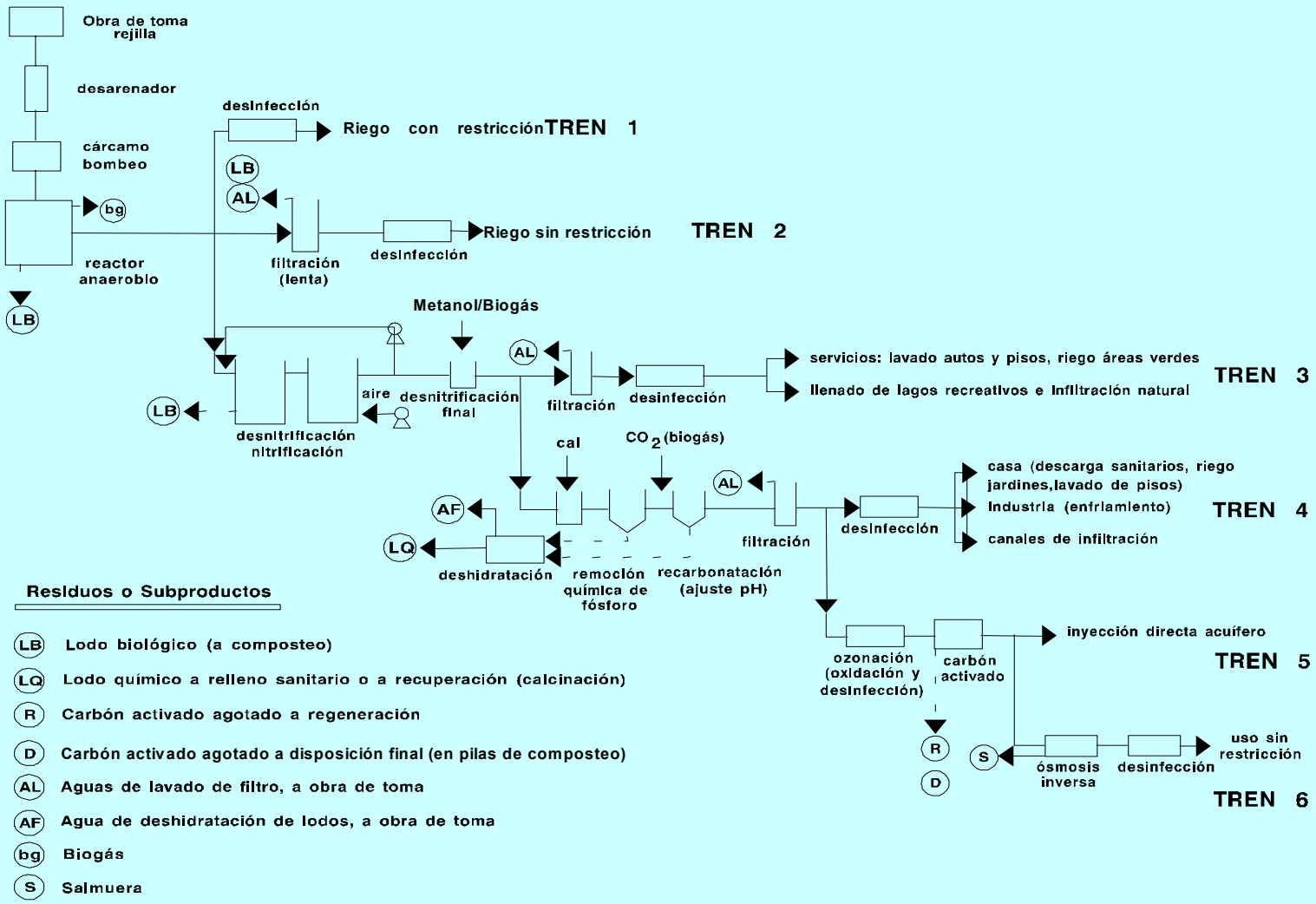

Fig 2. Tren de tratamiento de aguas residuales municipales para reuso

TECHNOLOGY SELECTION

- Basic process: Anaerobic tretament

+ It handles shock hydraulic and organic loads
+ Very low operational costs
+ Limited maintenace needs
+ Very low sludge production

- Lower BOD removal efficiencies (DBO > 40 mg/L)
- Odours

FINAL REMARKS

- New approches are needed in order to cope with water scarcity and low sanitation standards
- Sustainable resources managent should consider integrated and adapted solutions. Descentrailized wastewater treatment and reuse may provide a versatile answer
- There are well adapted technologies that may be used in order to reach different quality effluents, with low O & M costs
- Political, social supported decisions are needed in order to face the sanitation problem with new approches. Otherwise, the goals will never be attained.